

will scarcely be won over by the author's attempt to attain a definition more flattering to our self-esteem. A terse definition of reality as "an invariant in the relation between volition and sensations" (p. 100) expresses very aptly the author's point of view. The chapter on the physiological bases of logic brings out clearly the author's ultra-modern methods, and his treatment of non-Euclidean geometry shows that he is not greatly out of sympathy with Poincaré's demand to regard all postulates, not as fundamental verities, but as mere mutual agreements among philosophers.

The last chapters of the book deal with the root laws of mechanics and physics in a brilliant and entertaining manner, including, of course, the Principle of Relativity. In the treatment of the latter, it is regrettable that the author stopped at the Fitzgerald-Lorentz contraction without going on to Einstein's all-important work. His final *tour de force* is to show that freedom and necessity are not incompatible, inasmuch as there is a necessity for freedom in biological processes. That, at all events, seems the most concise way of putting his argument.

OUR BOOK SHELF.

The Book of Buchan: a Scientific Treatise, in Six Sections, on the Natural History of Buchan, Prehistoric Man in Aberdeenshire, and the History of the North-east in Ancient, Medieval, and Modern Times. By Twenty-nine Contributors. Edited and arranged by J. F. Tocher. Pp. xxi+508. (Peterhead: The Buchan Club, 1910.) Price 10s. 6d.

THIS is a compendium of essays, somewhat on the lines of the Victoria County Histories, dealing with the natural history, archæology, and history of a district of north-east Aberdeenshire, known from ancient times by the name of Buchan. The essays, which are published by the local Field Club and edited by its secretary, are of varying degrees of merit. There are excellent essays on the geology of the district by Mr. A. W. Gibb and Dr. T. F. Jamieson. Prof. J. A. Thomson gives an admirable sketch of the fauna of the district and their origin. Prof. Trail deals with the flora in an essay which is chiefly concerned with pointing out the imperfections of the present knowledge of the subject, and urging the local botanists to complete the survey which he himself has so well begun. A valuable essay on "Stone Cists in Aberdeenshire" is contributed by Prof. R. W. Reid, to which are added tables of measurements of the skulls and limbs of the remarkable race which inhabited east Aberdeenshire in the late Neolithic and early Bronze age. Important contributions also bearing on the prehistory of the district at the same epoch are "The Prehistoric Pottery of Buchan," by the Hon. John Abercromby, and "Some Notes on the Stone Circles of Aberdeenshire," by Sir Norman Lockyer. These essays represent the latest views on these interesting archæological questions by acknowledged authorities.

The remainder of the volume deals with the history of Buchan from the beginning of history up to modern times. Some of these contributions show evidence of considerable research and mastery of the subject, notably that on "Life in the Northern Burghs before the Reformation," by Dr. P. Giles, of Cambridge.

Many of the contributions are, however, not up to the above high standard. We have an essay on Gaelic place-names of a type which usually is produced by

the Celtic scholar with insufficient knowledge of philology, who relies chiefly on picking out words of similar sounds from a Gaelic dictionary. It is not surprising either that the editor, who writes with an air of great authority on nearly all the various subjects dealt with in the volume, should sometimes be caught tripping. We find him waxing enthusiastic about the maps of Ptolemy, evidently ignorant of the fact that there is no evidence that Ptolemy ever drew any maps, all the so-called maps of Ptolemy having been drawn by modern geographers from Ptolemy's descriptions. He also ascribes the writings of Bede to the seventh instead of to the eighth century.

On the whole, however, the volume is a credit to the science and scholarship of Aberdeenshire.

The Senior Botany. By Prof. F. Cavers. Pp. vii+484. (London: University Tutorial Press, Ltd., 1910.) Price 4s. 6d.

LIKE the three earlier text-books which Prof. Cavers has prepared for this series, the present work is admirably designed to portray the plant as a living entity, to indicate how structure is subservient to function, and to show that conditions and purpose underlie the manifold variations which plants assume. Much of the earlier chapters has appeared in one or other of the former books; the broad bean plant is selected as the introductory type, and the same satisfactory arrangement of information supplemented by experiment is adopted. Although a chapter is devoted to the microscope and cell structure, evidence requiring microscopic examination is generally avoided.

Photosynthesis is taken as the starting point for explaining metabolism, and the attractive theory, for which, however, further proof is required, of a conversion from light to electrical energy as the crucial operating factor is definitely formulated. Incidentally it is suggested that carbon assimilation is a more suitable expression than photosynthesis, but this depends upon the application of the term assimilation. Here, too, it seems desirable to raise a protest against the use of the word "stomate" on the grounds that "stoma" is more correct, and used generally, if not universally, by the best authorities. Among the various forms of transpiration measuring instruments, the best and simplest is not given; also it is observed that the interesting subject of soil physics is omitted except to advise reference to agricultural books.

There is an extensive chapter on ecology, which, with the chapters on flowers, classification, fruits and seeds, deserve special praise, as they are all explicit, stimulating, and copiously packed with detail; a few minor points of criticism arise, notably the description of monocotyledons as a lower class than the dicotyledons.

It should be understood that the qualification "senior" refers to the local examinations of Oxford and Cambridge. The book is well adapted for its purpose, although there is more information than most pupils in schools could assimilate; in addition, it can be strongly recommended to students in the polytechnics as a sound guide to the study of plant-life.

Praktikum der experimentellen Mineralogie mit Berücksichtigung der kristallographischen und chemischen Grenzgebiete. By Prof. E. Sommerfeldt. Pp. xi+192. (Berlin: Gebrüder Borntraeger, 1911.) Price 4.80 marks.

THIS little book is a veritable *multum in parvo*. It is astonishing how much information Prof. Sommerfeldt has succeeded in compressing into so small a compass; he has covered practically the whole range of physics and chemistry so far as these subjects may be applied

to the determination of the characters of minerals. He rightly believes that, while a careful study of the variety of specimens contained in a large mineral collection is most helpful towards acquiring facility in recognising mineral species, yet it is always desirable to be able to confirm a judgment by, or even to base it wholly upon, a few well-chosen tests, and this book is intended to assist students and others who may have occasion to identify mineral specimens in carrying out such tests.

The opening chapter deals with the goniometrical measurement and the perspective drawing of crystals, the calculation of the fundamental morphological data, and the measurement of refractive indices by the method of minimum deviation. In the next chapter the author passes on to the chemical examination by means of the blow-pipe, microchemical reactions, and the quantitative determination of the precious metals, coal, &c. The third chapter is concerned with crystal optics, and the fourth with the special application of these properties to use with the microscope. The last chapter includes the remaining physical characters, such as hardness, specific gravity, pyroelectricity, etching, melting point, and crystallisation, the phenomena presented by mixed crystals being considered at some length. In an appendix the author offers some hints on the kind of apparatus useful for prospectors and generally travellers interested in minerals, and considers the special case of precious stones.

The book has been carefully written, the hints given being evidently based upon the author's own experience, and it will be found to serve well the purpose for which it is intended.

Mikrographie des Holzes der auf Java vorkommenden Baumarten, im Auftrage des Kolonial-Ministeriums, unter Leitung von Prof. J. W. Moll, bearbeitet von H. H. Janssonius. Dritte Lieferung. Pp. 161-540. (Leiden: E. J. Brill, 1911.)

THIS is the third part of an extensive publication, designed to take advantage of a large number of Javanese wood specimens collected by Koorders with a view to the preparation of a forest flora for Buitenzorg. The collection is unique because corresponding herbarium material was gathered at the same time, so that the identity of each specimen can be accurately determined. The herbarium material was critically examined and described in the "Additamenta" noted in the title. The microscopic investigation is being conducted by Mr. H. H. Janssonius in great detail; a "topographical" or general description of the sections which would serve for most purposes is not considered sufficient, but copious details are supplied for each type of cell represented. Figures are only given for one species of each genus, and the scale of 1:25 is adopted; it would have expedited reference if a figure had been provided for each species on a scale of 1:10, enabling direct comparison to be made with illustrations provided in several standard works. The most valuable feature is the summary of anatomical characters drawn up for the analytical determination of genera and species. Prof. Moll suggested, in a notice of the earlier parts subscribed to the *Botanische Centralblatt* (vol. cxiii.), that it should be possible to determine not only the families but genera, and occasionally species, by the characters of the wood; the full consummation of this scheme is reserved for a final survey.

A book on these lines has long been a desideratum. Some estimation of the magnitude of the work can be formed when it is mentioned that this part completes a second volume of 540 pages, devoted entirely to the Discifloræ represented by 163 species or varieties.

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When Should a Child Begin School? An Inquiry into the Relation between the Age of Entry and School Progress. By W. A. Winch. Pp. iii+98. (Baltimore: Warwick and York, Inc., 1911.)

MR. WINCH's book is an admirable example of educational inquiry as it should be pursued. Instead of arguing on *a priori* grounds that children under five are better at home than at school, he shows by careful statistical methods what the actual effect of early entrance upon school courses is. His research shows in a thoroughly convincing way that those who begin school about five years of age do quite as well—often very much better—than those who begin at an earlier age. Stated quite moderately, it is clear that it makes no actual difference to the future school record whether a child begins at three or at five, though incidentally the figures suggest that delay beyond the fifth year is actually disadvantageous—a point in favour of English as opposed to German practice. Of course, many school authorities have already ceased to provide for children so young, not because of Mr. Winch's work, but because the State has withdrawn the grants. Yet it does not follow, of course, that the social value of the babies' classes in the infants' schools is nil. It is something that overworked wives are relieved for a few hours a day of the strain which young children in a small house commonly bring. But it is abundantly clear that formal school lessons of any kind before the fifth year is completed are quite unnecessary. Hygienic surroundings and playful occupations with abundant opportunities for sleep are chiefly wanted. Trained nurses rather than trained teachers, crèches rather than schools, would perhaps meet the situation.

J. A. G.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Orientation of the Great Temple of Amen-Ra at Karnak.

IN 1891 Sir Norman Lockyer made a magnetic survey of the axis of the great Temple of Amen-Ra, at Karnak, with the view of determining an astronomical date for the original building.

Since that time a great deal has been done in excavating and exposing the foundations of the older work along the temple axis, chiefly under the personal supervision of M. Legrain, of the Department of Antiquities, who for sixteen years has been the director of the explorations at Karnak.

On my recent visit to Karnak, where I spent some weeks, M. Legrain gave me the greatest assistance to enable me to make a resurvey of the axis in the light of the many new discoveries, and particularly in pointing out the parts of the original buildings still *in situ*, many of which he had himself uncovered, and all of which I afterwards measured and centred up.

Unfortunately, I arrived at a very unlucky time for carrying out this work, as the place was crowded with Arab workmen hauling out great stones from the excavations, and gangs of boys carrying baskets of earth from the diggings, all making as much noise as possible, that the place was more like a busy ant-hill than the eternal calm which might be expected in an Egyptian temple. In addition to this, the tourist season was at its height, and personally conducted parties were continually passing up and down, and naturally made a highway of the axis where I had set up my instruments. One soon forgets small inconveniences; but the torment of the insects, when both hands were occupied, is brought to mind by a remark made to me by a passing gentleman from the far West when he said, "Mr. Surveyor, I guess you're having a bully time with them flies."